

### **REMARKS/ARGUMENTS**

Claims 11-19 are currently pending in this application. No claims have been amended, added, or cancelled with the filing of this Response. Reconsideration of the application is requested in view of the following remarks.

### **Rejections under 35 U.S.C. § 103(a)**

The rejection of claims 11-14 under 35 U.S.C. § 103(a) as obvious over Janzen et al. (DD 145540A), claim 15 as obvious over Janzen et al. in view of Fike et al. (US Patent No. 6,312,503), and claim 16-19 as obvious over Janzen et al. in view of Serenkov et al. (DD 160829) are respectfully traversed.

As the Office is aware, it is well known that rejections under §103(a) must comply not only with the statutory provisions of §103, but also with the controlling case law. As was recently reaffirmed by the U.S. Supreme Court, *Graham v. John Deere Co. of Kansas City* sets out the controlling factual inquiries that must be made when considering and making a determination of obviousness under Section 103(a). (*See, KSR International Co. v. Teleflex Inc.*, 127 S.Ct. 1727, 1734-1740 (2007), citing *Graham v. John Deere Co. of Kansas City*, 383 U.S. 1, 17-18 (1966); *see also* MPEP §2141. Moreover, when determining the scope and contents of the prior art, the Office must consider the prior art in its entirety, including any disclosure that would lead away from the claimed invention. (*See, W.L. Gore & Associates, Inc. v. Garlock, Inc.*, 721 F.2d 1540, 220 USPQ 303 (Fed. Cir. 1983), cert. denied, 469 U.S. 851 (1984) (indicating that prior art references must be considered in their entirety, as a whole, including any disclosures that lead away from the claims at issue.))

In the present case, a comparison of the claimed process to the prior art of record clearly shows that there is no indication or suggestion that Janzen et al., Fike et al. and/or Serenkov et al. describe all of the features of the presently claimed process for purifying and cooling a gas stream.

#### ***Independent Claim 11***

A process for purifying and cooling a gas stream comprising a dialkyl ester A) of an aromatic dicarboxylic acid, which comprises treating the gas stream with an aliphatic dihydroxy compound B) at

a temperature less than/equal to the melting point of the dialkyl ester A) in a 1st stage and treating the gas stream with an aliphatic dihydroxy compound B) at above the melting point of the dihydroxy compound B) in at least one second stage, wherein the dihydroxy compound B) has a temperature less than/equal to 140°C in the first stage and has a temperature of from 20 to 80°C in the second stage.

Applicants point out that the 1st stage of the gas purification of, for example, a DMT-comprising gas is, according to present claim 11, carried out at or below the melting point of, for example, DMT, i.e., butanediol has in every case a temperature about 140°, since this is the melting point of DMT. Since the gas stream comprises DMT, it is important for the total process to work at or below this melting point in the 1st stage (see page 6, line 6 ff).

From page 7, line 24 ff, it is stated in the present specification that the gas stream is cooled in the 2nd stage but the 2nd stage is carried out above the melting point of the diol, i.e., in the case of butanediol this would be above 19°C, in the case of ethylene glycol or propanediol above -10°C or -32°C, respectively. Since the claim speaks of a process for purifying and cooling gas streams, it can be seen, with simultaneous interpretation of the description and examples, that both process steps are not to be carried out at the same temperature (see also preferred embodiment for DMT and butanediol on page 8, from line 7 ff); first purification, then cooling.

In the present claims, the choice of words in no way refers (both times) to the melting point of the diol, such that a two step process is clearly shown. Since a two-stage process is claimed, the claimed process is clearly novel over the cited prior art.

As the table below shows, the cited documents disclose either only cooling using other scrubbing media or purification. Applicants note that it is relevant to the subsequent discussion of the inventive step that the prior art all either cools or purifies, i.e., never describes a combination of these two modes of operation.

Regarding Serenkov et al., the transesterification by-product methanol is distilled off, carrying DMT with it. Here under pressure the DMT is dissolved in butandiol and the Methanol is collected in a receiver.

BD and DMT go directly back to the reaction (transesterification). No cooling is described.

<b>Document/ Patent</b>	<b>Scrubbing medium</b>	<b>Apparatus</b>	<b>Remarks</b>	<b>Mentioned in application - Differentiation</b>
DD 160829  Serenkov et al.	1,4- Butanediol	Absorption column	DMT-comprising vapor stream from PBT reactor, carrier gas = MeOH, scrubbing with 1,4-butane-diol in countercurrent, recirculation of butanediol/DMT mixture to reactor	Page 1, line 40- Page 2, line 4  * no cooling described
DD 145540  Janzen et al.	Glycol	Chamber vessel with bubble column + scrubber multistage	Storage of molten DMT, glycol used as scrubbing and barrier liquid, recirculation of DMT to process	Page 2, lines 20-32  *no cooling described  *high pressure drop due to barrier liquid
US 6312503  Fike et al.	Ethylene glycol	Countercurrent scrubber, multistage	Stripping of gas streams from PET reactor, gas stream comprising monomers + second reaction components, lower apparatus section = gas cooling, upper apparatus section = gas scrub, no DMT in the offgas mentioned	Page 3, lines 4- 18  *only cooling  *principle incorrectly described  *no recovery of material of value

Applicants point out that a significant improvement of the claimed invention is that DMT can be separated off from a gas stream without formation of industrially very difficult-to-handle DMT solids (desublimates) and the gas stream which has been purified in this way can subsequently be cooled without solids formation. It is achieved industrially by means of

appropriate temperature and concentration conditions in the two stages of the process, which cannot be derived from the documents cited.

Although Fike et al. describes a multistage process, the process is fundamentally different in principle and thus has clear disadvantages compared to the claimed process. In particular, whereas in the present invention, the first stage for removal of the ester from the gas phase is achieved by means of a gas scrub and the gas is subsequently cooled by means of a cold liquid (quenching) in a second stage, in Fike et al., the gas is firstly cooled at very low temperatures and the ester is then scrubbed out. Here, aerosol/mist formation is to be expected in the first stage due to the tendency of the system to desublime in the present case of DMT; this is avoided in a targeted manner by means of our invention, i.e. no desublimation occurs.

Moreover, in Fike et al., the temperature is at no point in the vicinity of the melting point of DMT and this document also gives no pointer to a combined mode of operation.

In Janzen et al., “2 stages” are formally indicated for purification, but the 2nd stage is preferably carried out at 110-130° (see claim 1); a combination is not encompassed or recommended de facto according to the claimed invention. Even assuming *arguendo* if 2 different stages are indicated, this “2nd stage” is in no way technically comparable to our process step.

Further, in Janzen et al., a gas is pushed through a liquid (see figure), which leads to an extreme pressure drop (is not technically comparable to “quenching”). Even if the liquid were here to reach the indicated 20°C, the contact time is not sufficient to cool the gas due to the circumstances of the apparatus. If appropriately long contact times were to be employed, cooling would still not be appreciable and the mode of operation would also become uneconomical.

On entering this stage, a tremendous pressure drop occurs (from a gauge pressure 500 mbar to ambient pressure on exit). Downstream of this, the stock tank would have to be designed appropriately for 1013 + 500 mbar gauge pressure, i.e. about 2 bar. However, this would lead to an increase in the thickness, larger pumps, etc. In summary, these lower limits cannot be achieved technically using the apparatus and mode of operation described in Janzen et al.

Correspondingly, it is also stated on page 2 of Janzen et al. that (last 4 lines, middle paragraph) an additional discharge (water separator) is required because of entrained volatile

components.

In addition, Applicants point out that Serenkov et al. does not make gas cooling possible and also does not render a combination with scrubbing obvious.

Overall, some “multistage” work-ups are mentioned in the documents, but either only cooling or only scrubbing is carried out. In the case of “only cooling”, sublimate formation occurs. In the case of “only scrubbing”, hot offgas (not permissible) is formed, there is a very high gaseous output and DM1 is lost in relatively large amounts.

As such, in view of the several differences and deficiencies, claims 11-19 are clearly novel and unobvious over the above-cited documents, alone or in combination. Therefore, reconsideration and withdrawal of the rejections are requested.

### **CONCLUSION**

In view of the above remarks, Applicants believe the pending application is in condition for allowance.

In the event the Examiner believes an interview might serve in any way to advance the prosecution, the undersigned is available at the telephone number noted below.

A one-month extension of time fee is due with this response. The Commissioner is hereby authorized in this, concurrent, and further replies, to charge payment or credit any overpayment to Deposit Account No. 03-2775, under Order No. 12810-00347-US from which the undersigned is authorized to draw.

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Respectfully submitted,

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